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MEMORANDUM FOR PRS (Contractor Publication)

FROM: PROI (STINFO) 20 October 2000

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-AB-2000-224**
Liu, C.T., "Investigating Near Tip Damage and Crack Growth Behavior in a Solid Propellant"

JANNAF Joint Meeting
(Cocoa Beach, FL, 26-30 Mar 2001) (Deadline: 06 Nov 2000) **(Statement A)**

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PHILIP A. KESSEL Date
Technical Advisor
Missile & Space Propulsion Division

12th Nondestructive Evaluation Subcommittee (NDES)
21st Rocket Nozzle Technology Subcommittee (RNTS)
34th Structures & Mechanical Behavior Subcommittee (S&MBS)
Joint Meeting
26-20 March 2001
Doubletree Oceanfront Hotel, Cocoa Beach, Florida

ABSTRACT

Title of Paper: Investigating Near Tip Damage and Crack growth Behavior in a Solid Propellant

Author(s): C. T. Liu

Is this paper an update? , Yes , No. X Has it been presented elsewhere? , Yes , No. X

When cracks occur, whether resulting from the manufacturing process or from service loads, the stresses near the crack tip will be redistributed according to nonlinear material behavior. Depending on the magnitude of the local stresses and the local strength, various defects, microvoids or microcracks, can develop in the crack tip region. And, depending on the severity of these defects, crack growth behavior can be significantly affected. Therefore, to obtain a fundamental understanding of crack growth behavior in particulate composite materials, the effect of the defect on local fracture behavior near the crack tip needs to be determined.

In recent years, a considerable amount of work has been done studying crack growth behavior in particulate composite materials. This work was based on linear elastic or viscoelastic fracture mechanics. The principles of classical fracture mechanics are well established for single-phase materials. However, experimental evidence indicates that linear fracture mechanics theories have been applied to particulate composite materials with varying degrees of success.

In this study, pre-cracked specimens were used to study local damage near the crack tip and crack growth behavior in a solid propellant under a constant strain rate at room temperature. The local damage state and its effect on crack growth behavior were investigated and the results were discussed.